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Mr. Daniel R. Wall
Project Manager
US Environmental Protection Agency
Region VII
Superfund Division
901 North 5th Street
Kansas City, Kansas 66101

January 19, 2006

Dear Mr. Wall:

Memorandum of Remedial Action Objectives, West Lake Landfill Operable Unit 2, Bridgeton, Missouri

Pursuant to an October 21, 2005 letter approving the revised Remedial Investigation and Baseline Risk Assessment reports dated September 16, 2005, following is a Memorandum of Remedial Action Objectives for the West Lake Landfill Operable Unit 2, Bridgeton, Missouri. Operable Unit 2 is defined as areas where landfill activities have been or are being conducted at the West Lake Landfill, excluding Operable Unit 1 Area 1 and Operable Unit 1 Area 2 (Remedial Investigation Report, Section 1.2.2, page 4). There are three areas of the site where landfill activities have been or are being conducted. These include what has been referred to as the Active Sanitary Landfill, the Closed Demolition Landfill, and the Inactive Landfill (see Figure 1). The area referred to as the Active Sanitary Landfill is a municipal solid waste landfill facility that has operated under Subtitle D regulations. The Active Sanitary Landfill ceased accepting wastes in January 2005. The Closed Demolition Landfill was an area that received demolition wastes. The Inactive Landfill is a former municipal solid waste landfill that reportedly began operations in the 1940s to 1950s and ceased accepting wastes in the 1970s.

PRESUMPTIVE REMEDY REMEDIAL ACTION OBJECTIVES

A 1993 document titled Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 540-F-93-035) provides guidance for the development of remedial action objectives (RAOs) for Operable Unit 2 of the West Lake Landfill. The referenced document states that RAOs should be developed on the basis of pathways identified for action in the site conceptual model. The site conceptual model was presented in the Remedial Investigation Report (revised 2005), and was further evaluated in the Baseline Risk Assessment Report (revised 2005). As described in the Baseline Risk Assessment Report, plausible human receptors include, under the current scenarios, on-site workers such as groundskeepers and transients/trespassers and nearby commercial/industrial workers. The nearest current permanent residence is approximately one-fourth of a mile from OU-2. Under future scenarios, plausible on-site human receptors include trespassers or workers such as a groundskeeper. As described in the Baseline Risk Assessment Report (revised 2005), the reasonable expected future use of the site will be industrial or commercial, and there will be no future residential use. Plausible future off-site receptors include off-site workers at surrounding commercial/industrial facilities. There is a

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potential for groundwater to move off-site where it could be used by future residential receptors located off-site of the landfill.

The Presumptive Remedy for CERCLA Municipal Landfill Sites lists typical primary RAOs, including:

- Preventing direct contact with landfill contents;
- Minimizing infiltration and resulting contaminant leaching to ground water;
- Controlling surface water runoff and erosion;
- Collecting and treating contaminated ground water and leachate to contain the contaminant plume and prevent further migration from the source area; and
- Controlling and treating landfill gas.

NON-PRESUMPTIVE REMEDY REMEDIAL ACTION OBJECTIVES

Non-presumptive remedies include:

- Remediating ground water;
- Remediating contaminated surface water and sediments; and
- Remediating contaminated wetland areas.

PRESUMPTIVE AND NON-PRESUMPTIVE REMEDY EVALUATION FOR WEST LAKE OU-2

The following sections discuss the application of presumptive and non-presumptive remedy remedial action objectives to the three areas of the site where landfill activities have been or are being conducted, including the Active Sanitary Landfill, the Closed Demolition Landfill, and the Inactive Landfill. The following sections address the presumptive and non-presumptive remedies via the following:

- Preventing direct contact with landfill contents, minimizing infiltration and resulting contaminant leaching to groundwater, and controlling surface water runoff and erosion – Cover Evaluation

- Collecting and treating contaminated ground water and leachate to contain the contaminant plume and prevent further migration from the source area; remediating groundwater – Leachate and Groundwater Characterization

- Controlling and treating landfill gas – Landfill Gas Characterization

- Remediating contaminated surface water and sediments and remediating contaminated wetlands – Surface water, sediments, and wetlands evaluation

Active Sanitary Landfill

The area referred to as the Active Sanitary Landfill is a municipal solid waste landfill facility that has operated under Subtitle D regulations. The Active Sanitary Landfill ceased accepting wastes in February 2005. A Closure and Post-Closure Plan is in-place for the Active Sanitary Landfill, and was written by Midwest Environmental Consultants, P.C. in September 1997. The Closure and Post-

Closure Plan was written to meet the requirements of 40 CFR Part 258 Subpart F, the Missouri Solid Waste Law section 260.226 and 260.227, Missouri Regulations 10 CSR 80, and the St. Louis County Management Code Chapter 607.

Cover Evaluation

The Closure and Post-Closure Plan includes provisions for a final cover designed to comply with the design/construction requirements of final cover systems in 10 CSR 80-3.010 and the St. Louis County Waste Management Code Chapter 607. The final cover system includes a two foot infiltration layer of compacted low permeability soil with a coefficient of permeability of 1 x 10-5 cm/sec or less and a one-foot erosion soil layer capable of sustaining vegetative growth. The final cover is required to be graded to promote runoff, minimize ponding, and establish vegetation. As described in the Closure and Post-Closure Plan, the final contours will be graded to slope no steeper than 3:1 (horizontal to vertical) on the sideslopes and 10% on the crown.

Runoff from the Active Sanitary Landfill is sampled on a quarterly basis from 5 outfall locations, pursuant to a National Pollutant Discharge Elimination System (NPDES) Permit most recently updated in May 2005. The outfall results are reported to the MDNR and the Bridgeton Landfill as the results become available.

Leachate and Groundwater Characterization

The Active Sanitary Landfill includes a leachate collection system. The leachate collection system has recently been upgraded to now include 7 collection wells, four of which became operational in November/December 2005. Because filling of the Active Sanitary Landfill primarily occurred within a previously-quarried area that extended below the water table, high volumes of leachate are collected. Based on information provided by Bridgeton Landfill personnel, the volume of leachate discharged during 2004 was about 37.5 million gallons. Leachate was formerly discharged to a leachate retention pond, where it was aerated prior to discharge to the Metropolitan St. Louis Sewer District. In 2004/2005, the leachate retention pond was closed. The Missouri Department of Natural Resources, Engineering Division, approved the closure of the leachate retention pond in a September 2005 letter. Leachate is currently discharged directly to the Metropolitan St. Louis Sewer District under a Permit that was renewed in October 2005.

The Active Sanitary Landfill has an existing Detection groundwater monitoring system that consists of 14 wells completed in 3 different zones, sampled semi-annually as described in the *Groundwater Sampling and Analysis Plan* prepared by Herst & Associates, Inc. in November 1998. A *Statistical Analysis Plan* prepared by Herst & Associates, Inc. in November 1999 details procedures for statistical evaluation of the data, reporting to the Missouri Department of Natural Resources, verification resampling if necessary, assessment monitoring procedures, and corrective action procedures, if necessary. The site remains in Detection monitoring.

Landfill Gas Characterization

A landfill gas collection and control system is present and operating at the Active Sanitary Landfill. The landfill gas collection and control system includes approximately 82 gas extraction wells, a piping network, a gas processing system, and a flare station. A *Construction Quality Assurance Report, Landfill Gas Collection and Control System Installation* was prepared by Aquaterra Environmental Solutions, Inc. in December 2005. As detailed in the *Construction Quality Assurance Report, Landfill*

Gas Collection and Control System Installation, 30 landfill gas collection wells were installed in October 31, 2005, including 23 new and 7 replacement wells to supplement the previously-operational network of landfill gas collection wells. The landfill gas collection piping network included new sections of 18-inch header pipe along the western perimeter of the landfill; new 16-inch and 12-inch lateral pipes across the landfill for connection to the new landfill gas collection wells and the 18-inch header pipe; new 10-inch, 8-inch, and 6-inch lateral pipes to connect the collection wells to the piping network; new 2-inch condensate air supply piping installed along the western perimeter of the landfill; and 6 new condensate traps. Based on a summary report provided by Bridgeton Landfill personnel, the volume of landfill gas combusted through the flare for the period January through November 2005 was about 955 million cubic feet., and the landfill gas collection system was operational an average of 95% of the time.

The Active Sanitary Landfill includes routine perimeter landfill gas monitoring using dedicated landfill gas monitoring probes.

Surface Water, Sediment, and Wetlands Characterization

There are no contaminated surface waters or sediments on the Active Sanitary Landfill property, nor are there contaminated wetlands. These non-presumptive remedies therefore are not applicable.

Active Landfill Summary

Based on the above summary and by reference based on the supporting documentation, the Active Sanitary Landfill Closure and Post-Closure care requirements meet or exceed the presumptive remedy remedial action objectives for West Lake Operable Unit 2. The area referred to as the Active Sanitary Landfill is governed by Subtitle D regulations, including cover requirements to prevent direct contact with landfill contents and to minimize infiltration and resulting contaminant leachate to groundwater, surface water runoff and erosion control, leachate collection and treatment, and landfill gas collection and treatment. There is no evidence that the Active Sanitary Landfill received or disposed of wastes outside the scope of wastes allowed by the permit. Accordingly, there is no need during the West Lake Landfill Operable Unit 2 RI/FS to formally consider the RAOs as applied to the Active Sanitary Landfill. RAOs applicable or relevant and appropriate to permitted Subtitle D landfills will be applied through Subtitle D as regulated under State of Missouri solid waste regulations, including institutional controls.

Demolition Landfill

The Closed Demolition Landfill was an area that received demolition wastes. The demolition landfill reportedly ceased accepting wastes in June 1995. There is no evidence that the Closed Demolition Landfill received or disposed of wastes outside the scope of the permit.

Cover Evaluation

A final cover is in place at the demolition landfill, and consists of a minimum of 2 feet of soil with a permeability of less than 1×10^{-5} cm/sec. A vegetative cover has been established on the demolition landfill. In a letter dated September 1, 2005, the Missouri Department of Natural Resources, Engineering Section, confirmed that a two foot cap thickness is acceptable and that the final cover is in good condition. The September 1, 2005 letter notes that final closure of the demolition landfill will be approved upon a department site inspection to verify that a thick, hardy stand of vegetation exists on the

landfill, recording the existence of the landfill with the county Recorder of Deeds, and submittal of a survey plat and an easement form for the department's review. The September 1, 2005 letter further states that since there are other permitted facilities at the site (i.e., the Active Sanitary Landfill), it is acceptable to complete one survey and one easement form for the entire set of landfills. Bridgeton Landfill personnel indicate that one survey and one easement form are planned for submittal, with submittal to be made concurrently with submittal of final closure documentation for the Active Sanitary Landfill. Final closure documentation for the Active Landfill is scheduled to be submitted by December 2006, based on a September 1, 2005 letter from the Department of Natural Resources, Engineering Section. It is therefore anticipated that the survey and easement form will be submitted by December 2006.

The Closed Demolition Landfill is included in NPDES sampling. Of the 5 NPDES sampling points identified in the May 2005 NPDES Permit for the site, all but one provide outfall data for flow that originates at least partially from the Closed Demolition Landfill.

Leachate and Groundwater Characterization

The Closed Demolition Landfill is not required to have a leachate collection system, per regulations.

The Closed Demolition Landfill does not have a formal detection groundwater monitoring network. Nearby groundwater monitoring wells were sampled as part of the West Lake Operable Unit 1 and West Lake Operable Unit 2 Remedial Investigation. There is no evidence of groundwater contamination attributable to the Closed Demolition Landfill.

Landfill Gas Characterization

The Closed Demolition Landfill is not required to have a landfill gas collection system, per regulations.

Surface Water, Sediments, and Wetlands Characterization

There are no contaminated surface waters or sediments on the Closed Demolition Landfill. There are no contaminated wetlands on the Closed Demolition Landfill. These non-presumptive remedies are therefore not applicable.

Closed Demolition Landfill Summary

Based on the above summary and by reference based on the supporting documentation, the existing conditions at the Closed Demolition Landfill meet or exceed the remedial action objectives for West Lake Operable Unit 2. The area referred to as the Closed Demolition Landfill is governed by State of Missouri regulations. There is no evidence that the Closed Demolition Landfill received or disposed of wastes outside the scope of wastes allowed by the permit. Accordingly, there is no need during the West Lake Landfill Operable Unit 2 RI/FS to formally consider the RAOs as applied to the Closed Demolition Landfill. RAOs potentially applicable or relevant and appropriate to the Closed Demolition Landfill will be applied through State of Missouri regulations, including institutional controls.

Inactive Landfill

The Inactive Landfill is a former municipal solid waste landfill that reportedly began operations in the 1940s to 1950s and ceased accepting wastes in the 1970s. The EPA previously inferred potential

solvent disposal in the Inactive Landfill based on historic areas of standing water identified through EPA review of aerial photographs.

Cover Evaluation

In 1995, a cover evaluation was performed for the Inactive Landfill. As described in an August 1995 draft report prepared by Golder Associates Inc., 44 borings were drilled though the Inactive Landfill cover. The sampling locations were oriented in rows, running in a north-south direction at 200-foot intervals. Alternating rows were off-set 200 feet east-west and 100 feet north-south of the preceding row. Cover thickness was determined by pushing a sampling device into the soil using hydraulic impact. Samples were then extruded, and the cover thickness was measured. Portions of the samples were submitted for grain size analysis and other geotechnical properties. Undisturbed samples were also collected at selected locations for subsequent permeability testing. All borings were backfilled with low permeability bentonite chips to prevent seepage through the cap.

According to 10 CSR 80-3.010(17)(C).4.A., the final cover at landfills without liners (such as the Inactive Landfill), shall consist of a 2-foot thick layer of compacted clay with a permeability of less than 1 x 10^{-5} cm/sec, overlaid with a 1-foot thick layer of topsoil Grain size analyses showed the Inactive Landfill cap material to be predominantly fine-grained material. The Inactive Landfill cap permeability ranged from 7 x 10^{-8} cm/sec to 1 x 10^{-5} cm/sec, with an average vertical permeability of 2.4 x 10^{-6} cm/sec. Landfill cap thickness ranged as high as 4.8 feet. Approximately 60% of the Inactive Landfill exhibited a cover thickness greater than 2 feet. The remainder of the Inactive Landfill cap exhibited a cover thickness of less than 2 feet.

Based on the data, an upgrade to the Inactive Landfill cap is needed to meet applicable or relevant and appropriate regulations, including additional low permeability soil in approximately 40% of the Inactive Landfill area to achieve minimum thickness requirements. A separate evaluation will be made to identify areas with less than 1-foot of top soil, and additional topsoil will be added as necessary.

The Inactive Landfill currently does not have an NPDES permit and does not monitor runoff quality. The alternatives evaluated as part of the Feasibility Study should include the establishment of runoff sampling points based on final topography and cover slopes along with resultant drainage patterns.

Leachate and Groundwater Characterization

As described in the Remedial Investigation Report, West Lake Landfill Operable Unit 2, revised September 2005 by Herst & Associates, Inc., six leachate risers designated LR-100 through LR-105 were drilled and installed in areas where EPA inferred industrial and/or hazardous wastes may have been disposed. In addition to sampling leachate from the inactive landfill, samples of leachate were collected from leachate risers previously installed in the Active Sanitary Landfill. A comparison was made between the leachate quality at the Inactive Landfill and the leachate quality at the Active Sanitary Landfill. Based on the comparison, fewer organic compounds were present in the Inactive Landfill leachate and the organics that were detected were at lower concentrations than in the Active Sanitary Landfill leachate. No solvents were present in the Inactive Landfill leachate. In summary, data collected as part of the Remedial Investigation, including drilling into and through the identified standing water areas and collection and analysis of samples in the presumed solvent disposal areas, did not confirm solvent disposal in the Inactive Landfill. Rather, it appears that the standing water identified in historic aerial photographs was associated with precipitation that had collected in low spots on the landfill cap.

Sampling conducted as part of the Remedial Investigation identified a small area of shallow groundwater impact near the extreme southwest corner of the Inactive Landfill. The impacted groundwater near the Inactive Landfill exhibited detectable concentrations of petroleum hydrocarbons and VOCs. The Baseline Risk Assessment confirmed that the identified concentrations represent a potential current and/or future health risk. As detailed in the *Remedial Investigation Report*, the potential source of the impacts could be either the Inactive Landfill or a leaking underground storage tank (LUST) site that is present just east of the Inactive Landfill, between the Inactive Landfill and the Active Sanitary Landfill.

Remedial Investigation groundwater samples were collected in 1995 and 1997. Supplemental groundwater sampling was conducted in 2003 and 2004. The supplemental sampling confirmed that the area of impacted groundwater is small and the concentrations are stable to declining. There are no current potential human receptors. As detailed below, there have been no identified surface water or sediment impacts. Based on the overall site characterization, a need for groundwater remediation is not indicated. Landfill cap upgrades to include additional low permeability soil, placement of topsoil, and subsequent vegetative cover to promote evapotranspiration are anticipated to address potential localized impacts from the Inactive Landfill by eliminating the source. If the groundwater impacts are a result of the LUST site, corrective actions anticipated to be performed by other parties as part of the LUST site remedial effort are expected to address the localized impacts by eliminating the source. It is recommended that long-term groundwater monitoring near the western boundary of the Inactive Landfill be evaluated as part of the remedial design phase of the project to allow verification of shallow groundwater quality improvement through time as a result of either the Inactive Landfill cover improvement or the LUST corrective actions.

It is recommended that continued groundwater monitoring near the Inactive Landfill be included in the alternatives evaluated as part of the Feasibility Study.

Landfill Gas Characterization

Sampling identified the presence of landfill gas in the Inactive Landfill. Landfill gas monitoring along the western portion of the Inactive Landfill, immediately outside of the filled area, was conducted by advancing expendable sampling points to a depth of approximately 3.5 feet below ground surface at 10 locations. Gas samples were then collected using a peristaltic pump attached to polyethylene tubing that was in turn attached to the sampling point. The sampling point was purged for a minimum of 20 minutes to draw landfill gas to the sampling point. Samples were collected by pulling soil gas into a Tedlar bag. After the Tedlar bag sample was collected, a photoionization detector and combustible gas indicator were used to determine volatile organic compound (VOC), hydrogen sulfide, and combustible gas concentrations. Hydrogen sulfide was not detected in any of the samples. There were no combustible gases detected in 8 of the 10 samples. The remaining two locations exhibited combustible gas concentrations of 3% of the lower explosive limit (LEL) and 130% of the LEL. Eight of the 10 sample locations exhibited no VOCs. The remaining two locations exhibited VOC concentrations of 7.6 ppm and 10.1 ppm. The perimeter landfill gas monitoring results indicate sporadic, isolated landfill gas impacts near the inactive landfill.

Additional landfill gas characterization was performed by sampling and analysis of 10 landfill gas monitoring locations along the crest of the inactive landfill. The landfill gas monitoring was conducted by advancing expendable sampling points to a depth of approximately 3.5 feet below ground surface. Sampling methods were similar to those employed for the perimeter landfill gas characterization

discussed above, except that landfill gas samples from the crest of the Inactive Landfill were collected in SUMMA canisters. Landfill gas results do not support the presence of widespread combustible gas within the Inactive Landfill. The Inactive Landfill does not currently incorporate either a passive landfill gas venting system or an active landfill gas collection system. It is recommended that the installation of a passive landfill gas venting system in the Inactive Landfill be further evaluated as part of the remedial design phase of the project, along with installation of a perimeter landfill gas monitoring system to provide long-term data regarding potential landfill gas migration. It is further recommended that the remedial design phase include provisions for upgrading to an active landfill gas extraction system in the Inactive Landfill if necessary based on perimeter landfill gas monitoring results.

Surface Water, Sediment, and Wetlands Characterization

Surface water and sediment samples were collected from the Earth City Stormwater Retention Pond, located immediately west of the Inactive Landfill. Samples were analyzed for the same constituents as groundwater samples. Based on the sampling results, the OU-2 area, including the Inactive Landfill, is not contributing measurable impacts to the Earth City Stormwater Retention Pond.

There are no identified wetlands on the Inactive Landfill.

Inactive Landfill Summary

The Inactive Landfill is not currently included in a formal regulatory program, and accordingly has no current or future regulatory compliance framework that would be considered equivalent to the presumptive remedies and/or non-presumptive remedies applicable or relevant and appropriate to the West Lake Landfill Operable Unit 2. The current cover on the Inactive Landfill does not appear to comply with final cover requirements, runoff from the Inactive Landfill is not currently monitored, landfill gas has been detected sporadically in perimeter monitoring locations, and shallow groundwater impacts have been observed in a localized area near the Inactive Landfill at concentrations that support the need for remedial actions based on a Baseline Risk Assessment. Accordingly, it is recommended that the Feasibility Study include an evaluation of alternatives designed to upgrade the landfill cover to meet regulatory requirements, which in turn are anticipated to address groundwater impacts by eliminating the source, if the source is the Inactive Landfill. In addition, it is recommended that the evaluated Feasibility Study alternatives include the establishment of runoff monitoring locations, to be based on the final cover topography and resultant drainage patterns.

SUMMARY OF RAOs FOR WEST LAKE OU-2

The goal of the Remedial Action Objectives Memorandum is to identify the remedial action objectives that will be further evaluated as part of the Feasibility Study and to identify the remedial action objectives that are adequately addressed under current conditions and current regulatory frameworks. The Remedial Action Objectives Memorandum has included a detailed discussion of the remedial action objectives as applied to the three areas of West Lake Landfill Operable Unit 2 where filling activities were formerly conducted. These three areas include the Active Sanitary Landfill, the Demolition Landfill, and the Inactive Landfill. Based on the detailed discussion and evaluation of remedial action objectives the Active Sanitary Landfill Closure and Post-Closure care requirements meet or exceed the presumptive remedy remedial action objectives for West Lake Operable Unit 2. RAOs applicable or relevant and appropriate to permitted Subtitle D landfills will be applied to the Active Sanitary Landfill through Subtitle D as regulated under State of Missouri solid waste

regulations. The existing conditions at the Closed Demolition Landfill meet or exceed the remedial action objectives for West Lake Operable Unit 2. RAOs potentially applicable or relevant and appropriate to the Closed Demolition Landfill will be applied through State of Missouri regulations. The Inactive Landfill area has a cover that does not meet applicable or relevant and appropriate regulations, has exhibited sporadic detections of landfill gas, and does not include a landfill gas collection system or a perimeter landfill gas monitoring system. It is recommended that the feasibility study include an evaluation of a remedial option that includes an upgraded Inactive Landfill cover. An upgraded Inactive Landfill cover is expected to eliminate the Inactive Landfill as a potential source of the isolated impacts to shallow groundwater, if the Inactive Landfill is the source of the observed impacts. Continued landfill gas perimeter monitoring and groundwater monitoring are proposed to be evaluated as part of the remedial design phase, along with the potential for a passive landfill gas venting system on the Inactive Landfill, with provisions for upgrading to an active landfill gas collection system if necessary based on perimeter landfill gas monitoring results. Alternative evaluations will also include institutional controls.

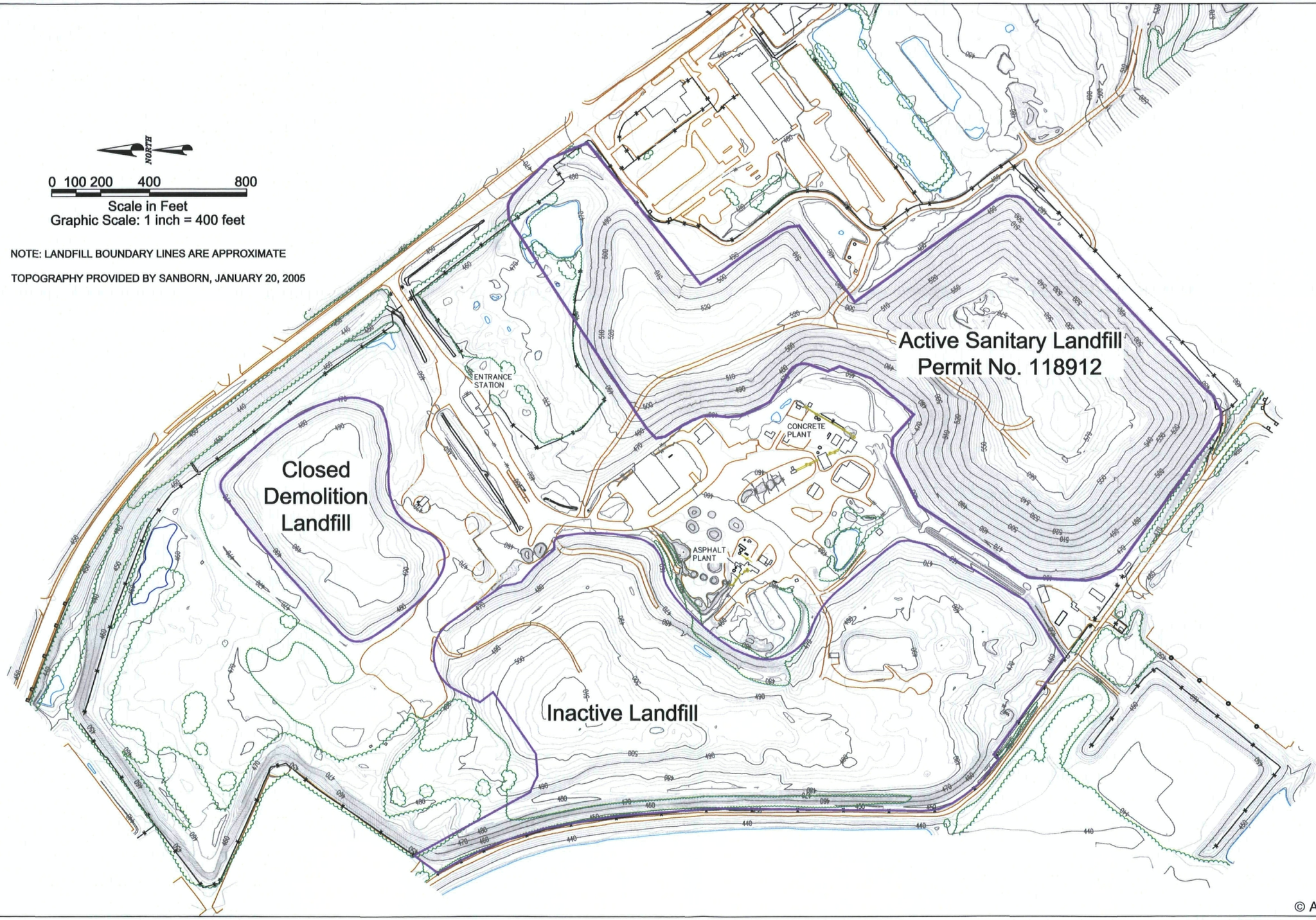
I trust that this Memorandum of Remedial Action Objectives meets your needs. If you have any questions, please contact Ms. Victoria Warren at 317-335-9550 or the undersigned.

Sincerely,

Herst & Associates, Inc.

Ward Herst, PG
Managing Director

Cc: Victoria Warren - AWIN
Michael Hockley – Spencer, Fane, Britt & Browne
Derrick Steen - MDNR



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West Lake Landfill OU-2
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Figure 1
Historic Waste Disposal Areas